

Your File System, A Survival Guide for NCSSMers

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September 26, 2020

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0 Introduction

This is a basic guide to smart use of your PC at NCSSM. It will address all operating systems, since they are all quite similar in the way you work with them. It will let you know some basic “birds ‘n’ bees” facts of life about your computer, and let you in on some serious tools that will help organize your life at NCSSM.

We are going to give a very basic explanation here and omit a lot of complexity that you can learn about later. There will also be advice on seeing to the health of your computer. Follow it. If your computer becomes sad, you will be even sadder.

Your computer, like a cake, has three layers: hardware, OS, and application.

The bottom layer is the hardware. This is the bare metal: memory chips, keyboard, mouse, monitor and other tangible components. There are two types of memory on your computer. One is RAM (random access memory); all programs running on your computer run in RAM. RAM is fast, expensive, and if it loses power, it loses all of the data stored in it. The other type of memory is your hard drive. Most hard drives today are SSDs (solid state drives). These allow for the permanent storage of data, but they are about 10X slower than RAM. We will refer to your SSD or hard drive as “the disk.” The controller for your computer’s hardware the CPU (central processing unit).

The second layer is the *operating system* (OS); this is the one program that controls all resources on your computer. The three most common OSs are Windows, MacOSX, and Linux in its various guises. The OS sits on top of the hardware. Here are some important things it does.

- The OS maintains your file system. This is what holds all of the data you generate or place on your computer. Every time you open or save to a file, the OS swings into action. Whenever you start a program, it is *loaded*, or copied, from the hard drive to RAM so it can execute. The OS allocates memory for your program and the program is loaded into that memory. If you don’t have enough RAM, and you are running too many programs, your computer may run very sluggishly.
- The OS doles out memory to all of your programs and keeps track of it. It takes that memory back when programs stop running. Quitting idle programs clears RAM for other programs to use.
- The OS decides what is to be executed when. It is the master scheduler of your computer. In a typical desktop session, dozens of programs will be running alongside each other. You have experienced this: you have your browser open, a media player, a network connection, and maybe a word processor. The OS manages their competing interests.
- Hardware events cause the OS to respond. For example, if you click in the window of an application, it gains focus. If you type a character, that character appears in a text editor window. You drag something with a mouse and drop it. All of these things demand the attention of the operating system.

The top layer, the application layer is where all of your applications, such as your browser, text editor, or media players, are running.

A Homily Keeping your OS up to date is extremely important for the security of your computer and the integrity of your data. Data vandals, thieves, ransomware artists, and trolls abound out there and the creator of your OS must stay ahead of them. You should update your computer within a day of

receiving notice of updates. Staying on top of this avoids annoyances like having the Windoze update manager shanghaiing your machine in the middle of a programming lab class.

As a matter of security, be suspicious of attachments you know nothing about. These can contain malware. Using a secure mail client such as GMail can help with this, but it is not an absolute defense.

1 Files and Folders

Your file system consists of files. These come in two major types. Directories are files that can “hold” other files. You can make directories very easily by right-clicking in a file explorer or finder window and selecting New Folder from the menu that appears.

The smart use of directories will make it easy for you to organize your data so you can easily find items pertinent to each of your classes or each of your major projects. A directory is basically a list of links that tell where each of its items is present on the disk. Your whole file system is based on links. We will use the term “regular file” to designate a file that is not a directory. The integrity of your file system is of paramount importance. Pay attention to this.

Another Homily Make sure you power down properly. Measures such as disconnecting your battery should only be used in an extreme circumstance. Usually, holding down the power button for a half-minute or so will cause your machine to offer to shut down. Availing yourself of this option ensures a proper shutdown. Part of the boot-down process involves the finalization of changes made in your file system during your session. Sudden disconnection from power can damage your file system, and in extreme circumstances, lose it.

Let us now take a look inside the file system. First let us learn a little about partitions and why they exist.

1.1 Partitions

If you are a Windoze user, you are accustomed to seeing such things as C:\ and D:\. A legit question you might have is *What are these?*. And here is a second question: *Why don't I see these on a Mac or a Linux box?*

When you install an operating system on a brand new computer, the drive is partitioned, or sliced into pieces. Customarily, on a Windoze machine, your system is in the C:\ partition. Some Windoze machines have a *recovery partition*, which allows you to recover a previous image of your machine's system and data.

If you attach an external drive, it might be labeled with another drive letter. You will also have a *user partition*, which contains the data files for all of the users on your machine. This partition is often hidden from you.

On Mac and Linux, partitions are completely hidden. However they are there. Typically, something like this occurs on a Mac or Linux box. Your system and your data are kept in separate partitions. You might also have a partition for programs you don't want to get deleted when you install a new OS.

Why do this? Think about submarines. Submarines are divided into sub-chambers that can easily be closed off. In this way, if the sub gets damaged far under the water, the damage can be limited to a sector or two, which the crew seals off.

This is the main takeaway here. Your drive is partitioned so all of your eggs are not in one big vulnerable basket.

When you upgrade your OS, only the system partition is affected, leaving your data alone. This makes it easy to do a clean install, which reformats the system partitions and puts a fresh copy of your OS on your computer.

2 Paths

Your computer maintains a *hierarchical file system* (HFS). This is a fancy way of saying that files are organized into directories. You can think of your file system as being one or more Australian (upside-down) trees. A file inside of a directory is often called a *child* of that directory. Other files in the same directory are called *siblings*. The directory containing a file is called its *parent directory*. Directories can have children. Regular files cannot.

On a Windoze machine, each drive letter supplies a root (highest) directory. For example **C:** is the root of your C (main) drive. Inside of it you will find directories such as **C:\Program Files**, which contains all of your applications.

On a Mac or a Linux box, there is one *root directory*, which has the mysterious name **/**. A *path* is a sequence of files that identifies a location in your file system. Paths come in two types, absolute and relative.

An absolute path is a sequence of files; only the last of these can be a regular file. The rest are directories. An absolute path on a Windoze box looks like this **C:\Program Files** and on a UNIX box looks like this

```
/home/morrison/public_html/index.php
```

2.1 Close your eyes and click your heels three times...

All modern computers have a *home directory*, which is the proper place for keeping your stuff. If you store files in application directories, they might not receive the protection that comes from being in the user partition. Having files scattered everywhere also creates real headaches for backing up your data (yes, you want to do this). This way, when you back up, you only need to back up your home directory to protect your data.

Finding your home directory is easy. On a Mac, it is located in `/Users/yourUserName`. On a Linux box, it is located in `/home/yourUserName`. If you are working on a server, your home directory might be located inside of another folder. For example `/home/2020/pitcher20a` is the home directory of a user; this system administrator is organizing users by year. If in doubt, open a terminal and type the following.

```
unix> cd
unix> pwd
/Users/morrison
```

The `pwd` command will show you your home directory.

On a Windoze machine, your home located in the `C:\Users` directory

3 Suggestions for NCSSM Students: The Last Homily

You can use a file explorer in Windoze or a finder window in Mac to do this procedure. Begin by making two directories, one for each of your two school years. Name them something obvious like 20202021 and 20212022, or junior and senior. The advantage of the numerical designation is that it will appear near the top of the list in an open or save dialog box. Go inside of your school year directories and make these directories.

1. S1, JTerm and S2: These hold class materials and assignments for the two semesters and JTerm.
2. admin: This can hold general school business that transcends semesters
3. college: Put material related to college search in here.
4. resLife: Put residence life documents here.

Inside of the semester directories, create a directory for each of your classes. Now comes the important part. As you get electronic stuff such as course materials,

you can save them into the correct directory. A little housekeeping up front will save you from having a directory with a disorganized tangle with hundreds of files in it. This can be frustrating when you are trying to find something you badly need in a hurry. If your teacher asks, “Where did you save it?” you don’t want to reply with a blank stare. It is important and stress-relieving to know exactly where your data are.

Additionally, if you have a major assignment in a class, create a directory for it, so you can easily find all you need for working on it.

Back up your home directory up each day before you go to bed. You can purchase an external drive for this purpose, or use a cloud backup service such as Carbonite. You will sleep easier and, if your computer takes a fatal header down the stairs, you still have the most valuable thing on it: your data.

4 For the UNIX Savvy

You can open a terminal. If you enter `cd` into it, you will be in your home directory. You can use the `mkdir` command to create new directories. There are many rewards for becoming command-line savvy. We have resources that will help you learn.

5 It’s a Date, Mate!

Attached to your NCSSM GMail account is a calendar. To view it, open GMail and look for the “waffle” in the upper right hand corner (it’s nine little squares or circles). Click on it; a menu will appear. From this menu, select Calendar. Use this calendar. You can put in stuff like extendeds, due dates for upcoming assignments, days for tests, days for noxious stuff like AP exams and SATs, and other critical dates.

In the left-hand column, there is a box labeled Search for People... You can enter a NCSSMer’s name (staff, student, teacher) in the box and see their Google calendar. You can use this to set an appointment to see a teacher, or you can create an event to invite people to get together to work on a group assignment.

The calendar will also remind you of upcoming stuff. It’s a great tool, costs you nothing, and it can save you work and hassle. Invest a little time in learning about it.